



# The Evidence

## Study on Regional Risk Factors Affecting Suicide among Youth and the Elderly

1. Study on regional risk factors affecting suicide among youths
2. Study on regional risk factors affecting suicide among the elderly

### Introduction

Recently, suicide has emerged as a social issue requiring immediate attention in Korean society. According to the 2011 research report on suicide in Korea (Korea Association for Suicide Prevention, 2011), the suicide rates gradually increased from 14.4 people per 100,000 and more than doubled in 2010 to 31.2 people. Compared to the Organization for Economic Cooperation and Development (OECD) member countries, the average suicide rates of the member countries in 2010 was about 15 people per 100,000, but Korea has taken the top seat for 8 consecutive years (OECD Factbook, 2013). The suicide status of Korea by age clearly shows the seriousness of this problem. The number of teenage suicides in Korea reached 353, accounting for 24.3% of teenage mortality and the number one cause of death (Statistical Year Book of Death, Statistics Korea, 2011). Unlike other OECD member countries where the death rates of teenagers aged between 15 and 19 years old gradually decreased, the rate increased in Korea (OECD Family Database, 2011). Likewise, the suicide rate of people aged over 60 years old has sharply increased compared to other age groups

as Korean demographics shift. Specifically, the suicide rate for those over 80 years old have reached over 100 per 100,000 people since 2002 (Korea Association for Suicide Prevention, 2011).


To this end, the National Evidence-based Healthcare Collaborating Agency (NECA) performed a study on regional risk factors affecting suicide among the youth and the elderly to propose grounds for establishing effective suicide prevention measures for people in the vulnerable ages.

### 1. Study on regional risk factors affecting suicide among youths

#### Risk factors reported in Korean studies

##### 1. Method

The factors reported as risk factors that affect suicide in adolescents in previous Korean research were investigated and categorized for comparison with reports from outside Korea, and a systematic review was performed to identify which factors have major effects. The search databases (DBs) used were the domestic core DB, which



includes KMBase, NDSL, KoreaMed, and RISS, and the search date was August 13th, 2012. The search term was limited to “adolescent suicide”.

## II. Result

A total of 357 studies (KMBase, 63 studies; NDSL, 67 studies; KoreaMed, 50 studies; and RISS, 177 studies) were searched. After reviewing the titles, 257 studies were selected, and the full texts were then reviewed to identify 75 studies that used suicide attempt and suicidal thoughts as outcomes.

The variable lists included in the studies and significant variables were separately by dividing them into suicidal thoughts (6 studies) and suicide attempt groups (69 studies) to determine the general properties of the ultimately selected studies. For any one reference that reported several outcomes, each outcome was included as one case. Established reports categorized the risk factors that affect adolescent suicide, including those described by Hawton et al. (2012), who proposed sociodemographic and educational factors, negative life incidents and family troubles, psychiatric disorders and psychological factors, description of suicidal behavior and reports of suicide in various media.

Similar categorical classification could be made from the domestic studies based on these investigations. The risk factors of the suicide attempt group were psychiatric disorders, sexual experience, and health behavior in descending order. Similarly, the risk factors of the suicidal thoughts group were other mental illnesses, psychiatric disorders, social factors, and sexual experience in descending order.

## The current status and risk factors of adolescent suicide

### I. Method

To identify adolescent suicide risk factors, the Korean Youth Risk Behavior Web-based Survey (KYRBW), which can reflect individual properties, was used to elucidate the relationship between suicide attempt and risk factors. Suicide attempt risk factors were studied by comparing the rate of suicide attempt by each characteristic (region, sex, age group) and using a multivariate logistic regression model. The same method was used to assess the impact of social and environmental factors.

Second, usable data among factors selected from a previous literature review were secured to select data that reflects regional social and environmental factors. Multivariate spatial regression analysis was performed using interregional spatial information to utilize the secured data and investigate the relevance of social and environmental/individual risk factors and the suicide rate of each region. The count data, including analyses, were converted to standardize per 100,000 people using the total population. The Conditional Autoregressive Model (CAR), one of the Bayesian spatial models, was used to build the model for the Standardized Mortality Rate (SMR) of adolescent suicide in each city using the spatial information from different regions.

### II. Result

Data from the 2010 KYRBW were analyzed to find out each individual's risk factors for adolescent suicide attempt, and the results showed that the risk was greater for females aged 12-14 years old with lower academic

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achievements, lower evaluation (below average) of subjective health; lower evaluation (average) of subjective happiness; moderate physical activity for 2-5 days or more; less attempt at weight control; more stress, more experiences with alcohol, smoking, sex, experience of sexual assault, and habitual drug abuse; feeling addicted to the internet; the number of family trips (1-3 or more); not living with their father; and depression. Also, "academic grades" among the causes of stress were used as the criterion for analysis to compare the risk of suicide attempt according to the type of stress, and the results showed that parental conflict, family circumstances, conflict with the teacher, relationships with friends, health problems, and stress over appearance/look all conferred greater risk than academic grades. The largest stressor among these was family circumstances.

Domestically available secondary data were gathered to investigate the regional social and environmental factors of adolescent suicide attempts. Such data include the number of psychiatric hospitals and psychiatrists from the annual Korean NeuroPsychiatric Association report; the number of adolescent depression diagnoses based on bills to the Health Insurance Review & Assessment Service (HIRA); the rates of unemployment, poverty, residence, labor, and single-parent families provided by the population census report of Statistic Korea; and the current status of young offenders and total crime incidence for each region using the statistical yearbook of the National Police Agency. The number of suicides was investigated using the mortality cause data of Statistic Korea from 2001 to 2010.

Multivariate spatial regression analysis was performed using the secondary data to calculate the suicide rate of

each region and the relationships with the local social and environmental/individual risk factors. The results showed that the suicide rate was significantly higher with more national basic livelihood security recipients, lower unemployment rate among those over 15 years old, and more 12- to 18-year-old patients treated for depression.

The areas with the highest and lowest mortality rates were selected, and the mean difference between these two areas was determined. The results showed a significant difference with the rate of single-parent family, householder with elementary school education or no education, number of national basic livelihood security recipients, and age. Independence was reviewed for adolescent-specific factors, and the results showed significance with the mother's academic background (middle school education or less/high school education or more), recognition of subjective health (recognition of one's health state as average or healthy/unhealthy, very unhealthy), and the number of family trips (none/one or more).

## Effects of the number of press reports on adolescent suicide

### 1. Method

In order to determine whether the number of suicide-related press releases in Korea affects the number of suicides in 12-25 year olds, the monthly amount of press releases in Korea that included suicide-related keywords from 2001 to 2010 was investigated, and the transfer function model, which is a time-series regression analysis, was applied. For each of nine data groups comprised of sex (all, male, female) and age (12-18 years old, 19-25 years old, and 12-25 years old), three input variables (suicide-related,

The analysis results of the impact of the number of press releases on the number of suicides in the 12- to 25-year-old age group revealed that the number of press releases in the current and previous months affected the number of suicides.

celebrity suicide-related, and student-related articles) and the output variable (the number of actual adolescent suicides) were each analyzed in a statistical model.

## II. Result

The analysis revealed that the number of press release in the current and previous months affected the number of suicides in 12-25-year olds. The age group was then divided into 12-18 years old and 19-25 years old to determine the effect for each age group; the number of press release seemed to have a significant effect on the suicides of those aged 19-25 years old but no effect on 12-18-year olds. The number of celebrity-related suicides, especially, had a significant effect on those aged 19-25 years old, regardless of their gender.

## Conclusion

Although the most recent data was from 2012, the following conclusion and policy recommendations can be deduced. The results of this Korean literature review is limited by the operant categorization of various factors, but the results indicate that psychiatric disorders in adolescents need to be treated aggressively to prevent suicidal thoughts and suicide attempts in this vulnerable population. Measures in consideration of suicide attempt risk factors that were investigated by analyzing secondary resources and the inclination of suicide method for each age group need to be considered when designing a suicide prevention program. The number of national basic livelihood security recipients, unemployment rate (in those over 15 years old) and interregional differences in risk factors of patients aged 12-18 years old who are treated

for depression need to be considered when establishing measures to prevent suicide in each area.

Notably, there is a need for prudent press releases regarding suicide in consideration of the effects of this risk factor by age group and keyword.

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## 2. Study on regional risk factors affecting suicide among the elderly

### Method

#### I . Evaluation of risk factors

To identify the risk factors that affect elderly suicide, key words including “elderly,” “suicide,” and “risk factor” were used to search reviews and systematic reviews in the search database PubMed. Based on the final selected literatures, risk factors that appeared to affect elderly suicide were classified into psychiatric/psychological factors, biomedical factors, life experiences, socio-environmental factors, and demographic characteristics. Among those

identified, final risk factors were selected based on the availability of the city/county/district level data and advice from the experts.

## II. Data source for the analysis

The study utilized the data for cause of death in the elderly between 2006 and 2010 by Statistics Korea and defined the analysis object as people older than 65 years old and “Intentional self-harm (X60-X84)” of the code of Korean Standard Classification of Diseases. The risk fac-

tor data sources included the Community Health Survey, the Population and Housing Census, Statistic Korea’s e-regional index, statistical data for current medical institution status provided by the HIRA, and the “2012 guidance for mental health service” issued by the Ministry of Health and Welfare. The base unit of the administrative zones was 248 cities/counties/districts based on the 2007 data. The selection criteria for the data source and variables describing the selected risk factors were based on provided sample data with local units. The study sought to

**<Table 1> Risk factors and variables of elderly suicide**

Risk factor		Variable		Risk factor		Variable	
Mental and psychological factor	Depression	Depression screening test (CES-D)	Social and environmental factor	Social activities	Join exercise programs in the community		
	Insomnia	Average sleeping time		Family relation	Household		
	Stress	Recognition rates of subjective stress		Employment, occupation	Economic activity		
	Suicide accident	Suicide accident		Economic independence	Beneficiary record		
	Suicide attempt	Suicide attempt		Health and medical services	Hospitalization/clinic		
Biomedical factor	Chronic disease	Chronic disease		Urbanization	Urbanization rates		
	Cancer	Cancer diagnosis		Elderly welfare	Portion of welfare budget out of the general accounting		
	Physical status	Physical status with severe disability		Elderly welfare	Number of welfare facilities for the elderly		
Life experience and demographic feature	Local suicide history	Suicide rates for every 100,000 people		Population density	Population density		
	Gender	Gender		Population movement	Population movement		
	Age	Age		Local economy level	Financial independence		
	Religion	Religion		Quality of life	EQ-5D		
	Marital status	Current marital status		Access to healthcare services	Number of institutions		
	Smoking	Smoking rates		Comprehensive policies to prevent suicide	Psychiatric healthcare center		
	Drinking	Drinking rates					
	Education level	Final education level					

select variables from the same data source as much as possible, and the final decision was settled through expert consultations.

### III. Final Selected Risk Factors and Variables

The final selected risk factors and the variables are shown in Table 1. Please refer to the research report titled 'Regional Risk Factors Affecting the Elderly Suicide' from the website of the NECA for specific description on variables and data sources.

### IV. Analysis

The study calculated the suicide rates of the elderly per 100,000 people on a regional basis and the SMR based on the registered 2008 population data by Statistics Korea to compare the suicide features for people older than 65 years, younger than 65 years old and all age groups using statistical data on cause of death and investigate the local distribution of the elderly suicide. Then, the study selected 25 regions from the top and bottom 10% of 248 districts based on the calculated SMR and analyzed the data to investigate the differences among regions with high and low SMRs and risk factors.

In addition, the Poisson regression model was implemented to control for gender, and causes estimated as the risk factors of elderly suicide were applied to the models to investigate local features related to elderly suicide. The study considered spatial correlations based on significant causes from the Poisson regression model and implemented the CAR model to investigate significant local features of elderly suicide. The variables used in the CAR model were 30 variables defined in Table 1 except stress, accidental suicide, social activities, employment and oc-

cupation, frequency of health and medical service use, elderly welfare, population density, population shift, access to health services, age, and marital status.

## Result

### I. Features in the elderly suicide (cause of death data)

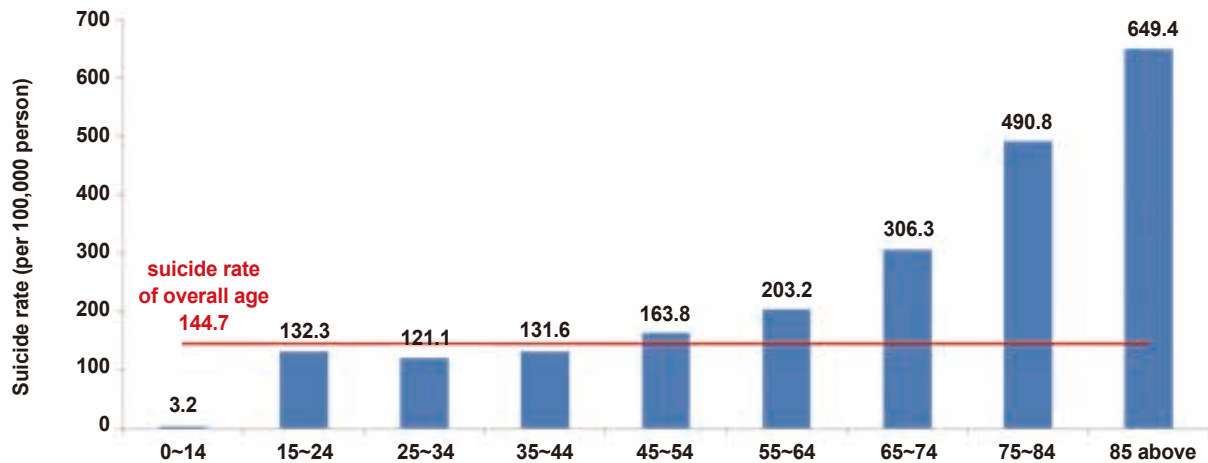
The number of suicide deaths for individuals older than 65 years old between 2006 and 2010 was 18,748, accounting for 28.1% of the total suicide deaths. Males accounted for 62.3%; 74% of the deaths among students, housewives, and unemployed individuals; and 17.9% were experienced workers in the agricultural and fishery sectors. Marital status analysis showed that with spouse (54.0%) was the first and was followed by widow/widower (40.2%). The educational background results showed that 39.7% completed elementary school, and 31.9% had no education. Death at the house accounted for 34.9%, and 33.7% died in a medical institution. The most common causes of death were hanging, pressure, and asphyxiation (39.3%) and pesticide (37.9%). Figure 1 shows the suicide rates per 100,000 people by ages with the parent group of the mid-year population in 2008 and the data for cause of death between 2006 and 2010.

### II. Analysis of risk factors for elderly suicide

Table 2 shows the risk factors with regional differences in high and low SMRs based on the result of risk factor analysis from various data sources, including the community health survey results.

In addition, the study implemented the CAR model to understand the risk factors in consideration of the spatial correlations among cities/counties/districts. The risk fac-

Physical activity and education levels and the portion of the elderly who live alone were negatively associated with the SMR, but smoking rates, proportion of people who attempted suicide and quality of life showed positive relationships.



\* Suicide rates for every 100,000 people of all ages

<Figure 1> Suicide rates for every 100,000 people by ages\* (2006 - 2010)

<Table 2> Features in regions with high elderly suicide rates

Risk factor	Regional features in high elderly suicide rates
Demographic feature	A lot of the elderly bereaved with spouses A lot of the elderly with low academic background Less religious activities among the elderly High rates of smoking among the elderly
Mental and psychological factor	A lot of the elderly sleeping less
Biomedical factor	Elderly with less chronic diseases A of the elderly without severe physical activities
Socio-environmental factor (Regional factor)	A small number of the elderly with less occupations or employment Low degree of using health and medical services from the elderly Low urbanization rates Low portion of welfare budget A lot of welfare facilities for the elderly against the elderly population Smaller number of the elderly beneficiaries Low population density Small number of medical institutions Less population movement

tors judged to affect elderly suicide were physical activities, smoking rates, rate of people who attempted suicide, average education level, quality of life, and the proportion of the elderly who live alone after applying the CAR model. The physical activity and education levels and the

proportion of elderly who live alone were negatively associated with the SMR, but the smoking rates, proportion of people who attempted suicide, and quality of life showed positive relationships (Table 3).

**<Table 3> Estimates of risk factors by CAR model (Conditional Auto Regressive model)**

	Estimate	95% Confidence interval
Gender (male)	0.74	(-0.16, 1.55)
Cancer	-0.47	(-1.72, 0.85)
Chronic disease	0.05	(-0.17, 0.25)
Physical activities	-0.81	(-1.4, -0.2)
Smoking	0.96	(0.22, 1.69)
Drinking	-0.71	(-1.66, 0.27)
Suicide attempt	3.21	(0.19, 6.27)
Depression	0.14	(-0.39, 0.68)
Sleeping	0.03	(0, 0.07)
Education level	-0.13	(-0.19, -0.08)
Quality of life	0.60	(0.02, 1.02)
Urbanization rate	-0.14	(-0.42, 0.16)
Psychiatric healthcare center	-0.02	(-0.06, 0.01)
Financial independence	-0.27	(-0.6, 0.11)
Number of welfare facilities for the elderly	0.04	(0, 0.08)
Beneficiary	0.00	(-0.04, 0.04)
Single	-2.42	(-3.07, -1.71)
Religion	0.04	(-0.42, 0.5)
Regional history of suicide	0.02	(-0.05, 0.1)

### Conclusion

Various analyses were performed to investigate regional risk factors in elderly suicide. The results showed that marital status, academic background, religious activities, smoking rates, sleeping time, chronic diseases, and physical activities were significant factors. Regional significant features included urbanization rate, portion of welfare budget, number of beneficiaries, population density, and movement. It is expected that the study may be utilized

to establish policies to prevent elderly suicide on a local basis.

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